

## Mechanical Survey of the Conductive Glue Placement Sites on the Production Baseboards

**V 1.0**

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### Introduction

We have received 30 baseboards to start the barrel module production. There has been an incident with the first baseboard, when it was glued to the holding plate "on the other side". RAL group had similar experience. At their suggestion, we have visually surveyed the remaining baseboards for the presence of the epoxy in the vias near the conductive glue site. We have also measured the depth of each site. The results are presented below.

### The measurements

We used the ZIP400 SmartScope to measure the depth of each site. Two measurements are done:

- the Z height of the surrounding plane of epoxy relative to the center of the site ("Z1"),
- the Z height of the edges of the site relative to the center ("Z2").

Figure 1 illustrates the definitions. We interpret Z2 as the site depth, and Z1 as the site shape parameter.

The survey surface is uneven. The measurement reproducibility is at the level of 2-4  $\mu\text{m}$ .

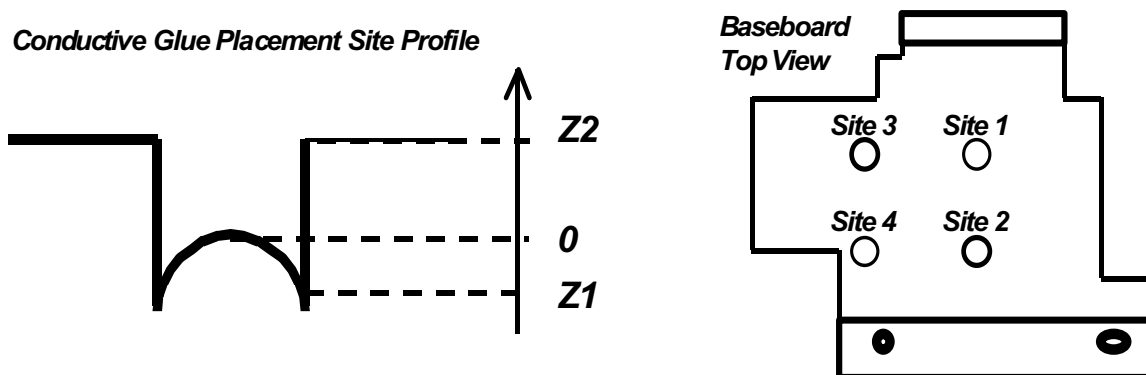


Figure 1. Schematic of the conductive glue site measurements.

The numerical results are given in the following table.

	Front								Back								
	Site 1		Site 2		Site 3		Site 4		Site 1		Site 2		Site 3		Site 4		
Serial #	z1	z2	z1	z2	z1	z2	z1	z2	z1	z2	z1	z2	z1	z2	z1	z2	Comment (if have throughholes)
110138	34	111	-8	56	40	80	-13	43	-34	-3	18	59	-23	14	27	64	OK
110139	36	100	5	64	-15	63	50	133	-17	25	16	54	2	62	-44	9	OK
110141	60	160	-28	66	32	177	-30	80	-42	-27	-18	53	6	74	-24	38	Hole in 3
110142	-10	137	28	150	28	134	4	127	-44	34	-48	16	-38	-1	-49	22	Hole in 1
110143	-24	38	-35	46	-52	25	-55	44	-3	87	-9	85	24	162	-2	106	OK
110144	13	77	-36	44	-31	14	-64	0	-13	74	-35	61	0	71	10	100	OK
110145	-38	6	-17	23	-29	36	-37	33	44	160	43	115	1	84	13	82	OK
110147	-37	47	-56	15	-53	31	-86	29	-22	81	16	124	-19	99	32	164	OK
110149	-22	60	-35	57	-47	52	-77	30	-31	73	-20	84	-5	123	3	145	OK
110150	15	102	-42	103	-14	68	-11	70	-43	28	-27	53	-27	39	-39	38	OK
110151	-28	21	-26	33	-32	47	-33	42	-9	74	-14	47	-15	57	5	73	OK
110153	-10	76	-25	70	13	105	4	87	-27	50	-33	50	-63	47	-73	28	OK
110156	-21	48	-24	44	-34	40	-45	21	-18	65	-15	59	-17	63	-13	73	OK
110159	-22	70	-20	65	-20	43	-30	65	-19	56	-35	66	-5	76	-12	90	OK
110161	16	120	-25	102	15	139	-2	115	-41	51	-21	72	-43	67	-16	77	OK
110162	-7	69	-21	57	-20	76	-33	53	-17	62	-16	69	-25	57	-46	39	OK; NO BARCODE!!
110163	-24	61	-35	71	-29	38	-25	67	-13	62	-27	66	-6	111	-22	90	Hole in 3
110166	-29	49	-51	41	-22	54	-32	55	-9	86	-20	81	-21	75	-42	86	OK
110167	-14	45	-35	48	-37	48	-24	46	-21	58	-30	40	-25	58	-17	61	OK
110168	-30	66	-54	86	-37	56	-52	46	-24	102	-20	76	-21	72	-25	91	OK
110169	-20	68	0	105	8	127	-18	110	-43	34	-48	32	-50	43	-47	53	OK
110170	-26	49	-24	55	-60	30	-49	26	-26	55	-20	62	-5	84	-8	88	OK
110171	-28	54	24	114	-30	70	-31	81	-23	46	-29	39	-26	35	-53	44	OK
110172	-35	35	-34	46	-23	6	-34	41	0	75	-7	65	24	111	1	72	OK
110173	3	64	5	78	-5	77	-14	82	-35	44	-46	39	-33	28	-59	28	OK
110174	-19	41	-29	44	-15	62	-30	52	5	86	-28	61	-8	84	-17	56	OK
110175	-33	64	-8	56	1	90	1	90	9	78	-16	41	-25	28	-45	21	OK
110176	-15	99	-31	106	-16	94	-33	91	-43	58	-56	62	-42	49	-56	60	OK
110177	-41	45	-41	52	-2	23	-60	40	-7	97	-38	102	-2	156	24	169	Hole in 4

**Table 1. Raw measurement data for Z1 and Z2 in microns.**

The histograms of all Z1 and Z2 measurements (Figure 2) do not reveal any gaps in the distributions. The average of Z1 is  $-20 \mu\text{m}$  and the average of Z2 is  $66 \mu\text{m}$ . Both distributions are rather wide, with long tails. The known spec on the depth of the site is  $30 \mu\text{m}$  [1].

The shape of the distribution does not change significantly when plotted for the baseboards with missing epoxy (Figure 2, blue histograms). This is due to

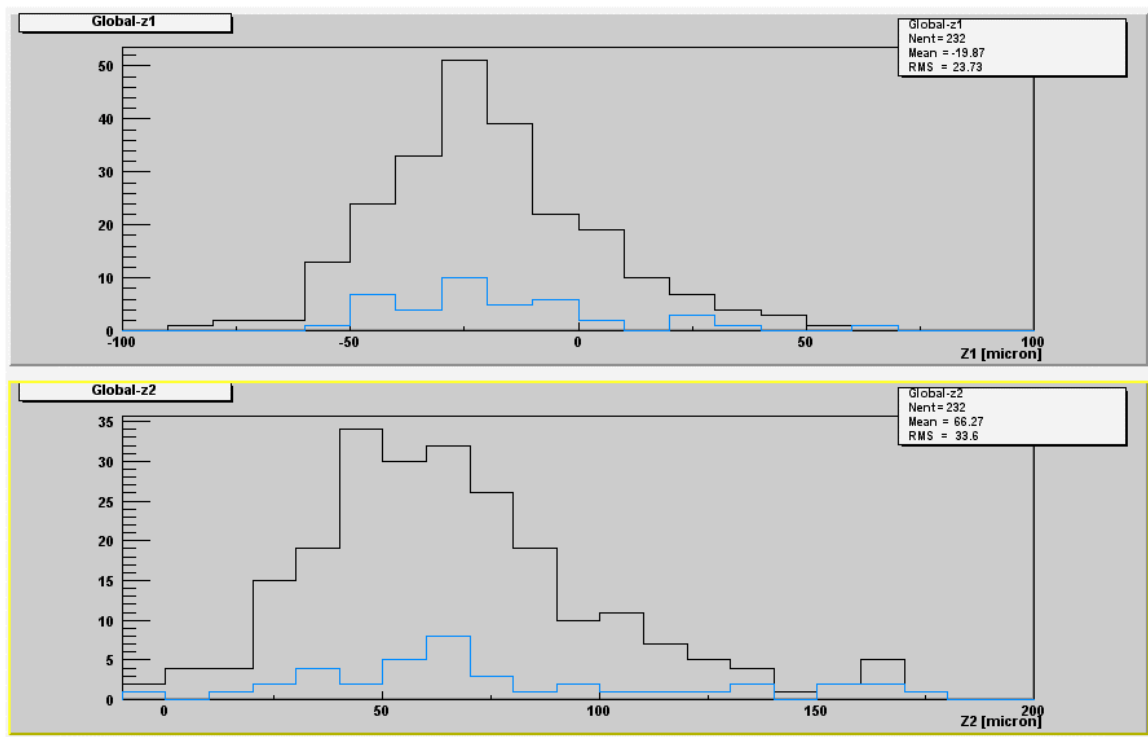
the fact that different sites depths are not correlated, so that the good 3 sites for a defective baseboard look normal. If we look at the bad site data only, then either front or the back side depth would be large (more that 100  $\mu\text{m}$ ), as shown in Table 2.

Serial #	Front		Back	
	Defective site	Defective site	Defective site	Defective site
	z1	z2	z1	z2
110141	32	177	6	74
110142	-10	137	-44	34
110163	-29	38	-6	111
110177	-60	40	24	169

**Table 2. Data for the sites with missing epoxy in a via.**

The Z1 and Z2 are correlated, as shown in Figure 3. For deep sites, the edges of the site are elevated with respect to its center, unlike the schematics in Figure 1.

We do not see any obvious dependence of the site depth on the serial number, as shown in Figure 4.



**Figure 2. Distributions of Z1 (top) and Z2 (bottom) for all sites and baseboards. The blue histograms display the data for the baseboards with missing glue in the vias.**

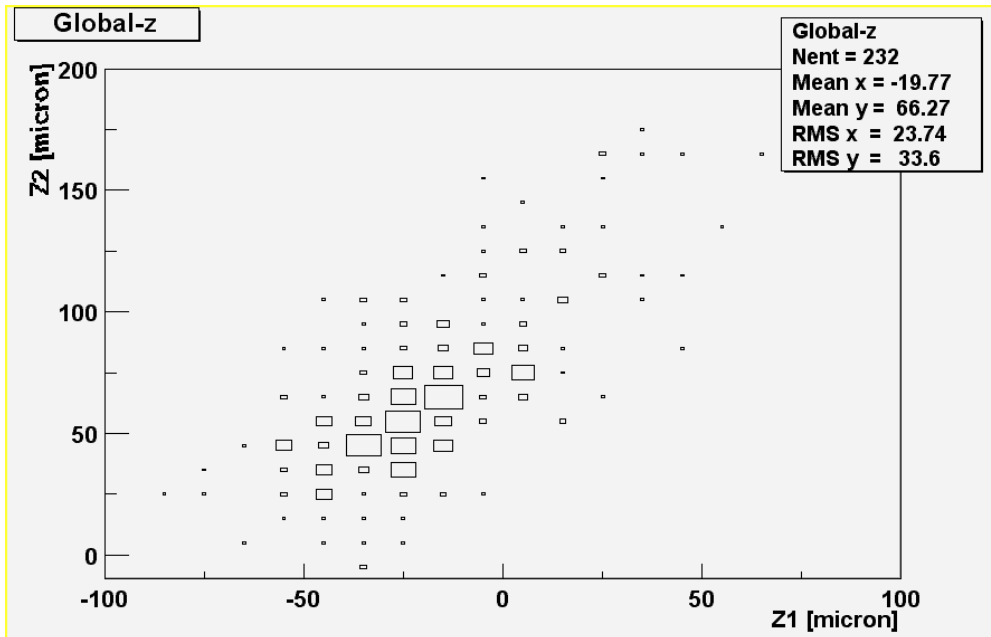


Figure 3. Z2 versus Z1 for all sites and baseboards.

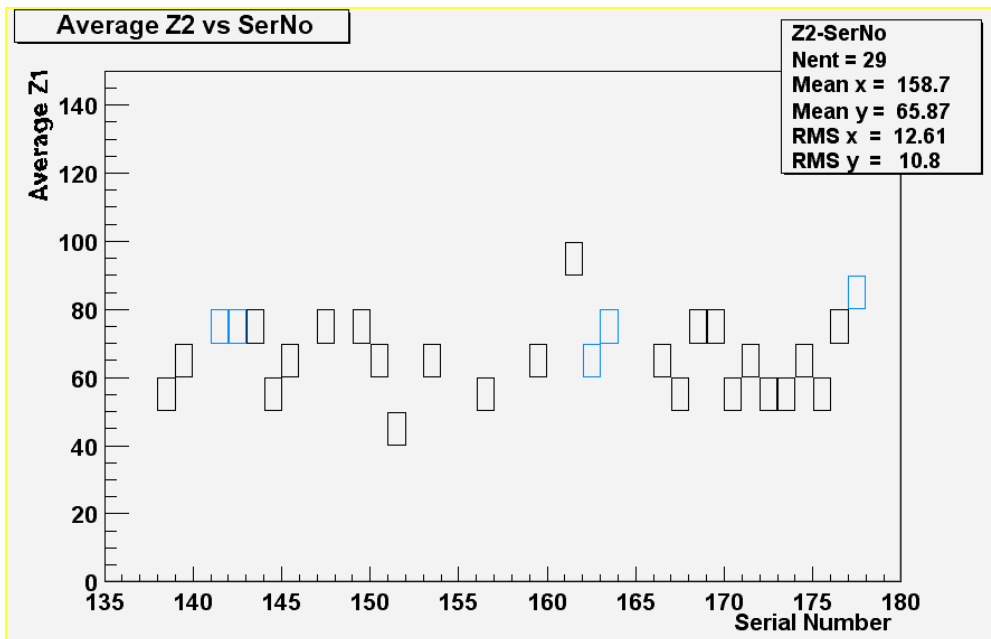


Figure 4. Average Z1 versus serial number. Blue boxes indicate the baseboards with missing epoxy.

## **Conclusions**

We have surveyed the baseboards received. The defective baseboards have large, over 100  $\mu\text{m}$  depth for the site with missing epoxy in a via. However, the distribution of the depth is broad. If the baseboard thickness at the sites is a concern, then the good baseboard selection criteria are not obvious.

We noticed that the shape of the site is correlated with its depth.

There does not seem to be any dependence of the defects on the baseboard serial number for our sample.

One baseboard did not have the barcode.

## **References**

1. R. Apsimon, A. Carter, J. Carter "SCT Barrel Module: Module Components Section 5.2: Baseboards", SCT-BM-FDR-5.2 .